



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2022-0017; Project Identifier AD-2022-00058-T; Amendment 39-21937; AD 2022-03-20]

RIN 2120-AA64

Airworthiness Directives; The Boeing Company Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule; request for comments.

SUMMARY: The FAA is adopting a new airworthiness directive (AD) for all The Boeing Company Model 737-8, 737-9, and 737-8200 airplanes. This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band), and a recent determination that, during takeoffs and landings, as a result of this interference, certain airplane systems may not properly function, resulting in longer than normal landing or rejected takeoff distances due to the effect on thrust reverser deployment, spoilers, speedbrake deployment, and increased idle thrust, regardless of the approach type or weather. This AD requires revising the limitations and operating procedures sections of the existing airplane flight manual (AFM) to incorporate limitations prohibiting the use of certain minimum equipment list (MEL) items, and to incorporate operating procedures for calculating takeoff and landing distances, when in the presence of 5G C-Band interference as identified by Notices to Air Missions (NOTAMs). The FAA is issuing this AD to address the unsafe condition on these products.

DATES: This AD is effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

The FAA must receive comments on this AD by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- Federal eRulemaking Portal: Go to <https://www.regulations.gov>. Follow the instructions for submitting comments.

- Fax: 202-493-2251.

- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

- Hand Delivery: Deliver to Mail address above between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Examining the AD Docket

You may examine the AD docket at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2022-0017; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this final rule, any comments received, and other information. The street address for the Docket Operations is listed above.

FOR FURTHER INFORMATION CONTACT: Dean Thompson, Senior Aerospace Engineer, Systems and Equipment Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3165; email: dean.r.thompson@faa.gov.

SUPPLEMENTARY INFORMATION:

Background

In March 2020, the United States Federal Communications Commission (FCC) adopted final rules authorizing flexible use of the 3.7-3.98 GHz band for next generation services, including 5G and other advanced spectrum-based services.¹ Pursuant to these rules, C-Band wireless broadband deployment was permitted to occur in phases with the opportunity for operations in the lower 0.1 GHz of the band (3.7-3.8 GHz) in certain markets beginning on January 19, 2022. This AD refers to “5G C-Band” interference, but wireless broadband technologies, other than 5G, may use the same frequency band.² These other uses of the same frequency band are within the scope of this AD since they would introduce the same risk of radio altimeter interference as 5G C-Band.

The radio altimeter is an important aircraft instrument, and its intended function is to provide direct height-above-terrain/water information to a variety of aircraft systems. Commercial aviation radio altimeters operate in the 4.2-4.4 GHz band, which is separated by 0.22 GHz from the C-Band telecommunication systems in the 3.7-3.98 GHz band. The radio altimeter is more precise than a barometric altimeter and for that reason is used where aircraft height over the ground needs to be precisely measured, such as autoland, manual landings, or other low altitude operations. The receiver on the radio altimeter is typically highly accurate, however it may deliver erroneous results in the presence of out-of-band radio frequency emissions from other frequency bands. The radio altimeter must detect faint signals reflected off the ground to measure altitude, in a manner similar to radar. Out-of-band signals could significantly degrade radio altimeter functions during critical phases of flight, if the altimeter is unable to sufficiently reject those signals.

¹ The FCC’s rules did not make C-Band wireless broadband available in Alaska, Hawaii, and the U.S. Territories.

² The regulatory text of the AD uses the term “5G C-Band” which, for purposes of this AD, has the same meaning as “5G”, “C-Band” and “3.7-3.98 GHz.”

The FAA issued AD 2021-23-12, Amendment 39-21810 (86 FR 69984, December 9, 2021) (AD 2021-23-12) to address the effect of 5G C-Band interference on all transport and commuter category airplanes equipped with a radio (also known as radar) altimeter. AD 2021-23-12 requires revising the limitations section of the existing AFM to incorporate limitations prohibiting certain operations, which require radio altimeter data to land in low visibility conditions, when in the presence of 5G C-Band interference as identified by NOTAM. The FAA issued AD 2021-23-12 because radio altimeter anomalies that are undetected by the automation or pilot, particularly close to the ground (e.g. landing flare), could lead to loss of continued safe flight and landing.

Since the FAA issued AD 2021-23-12, Boeing has continued to evaluate potential 5G C-Band interference on aircraft systems that rely on radio altimeter inputs. Boeing issued Boeing Multi Operator Message MOM-MOM-22-0016-01B(R1), dated January 16, 2022, and Boeing Flight Crew Operations Manual Bulletin TBC-26, “Radio Altimeter Anomalies due to 5G C-Band Wireless Broadband Interference in the United States,” dated January 17, 2022.

Based on Boeing’s data, the FAA identified an additional hazard presented by 5G C-Band interference on The Boeing Company 737-8, 737-9, and 737-8200 airplanes. The FAA determined anomalies due to 5G C-Band interference may affect multiple other airplane systems using radio altimeter data, regardless of the approach type or weather. These anomalies may not be evident until very low altitudes. Impacted systems include, but are not limited to: autopilot flight director system; autothrottle system; engines; thrust reversers; flight controls; flight instruments; traffic alert and collision avoidance system (TCAS); ground proximity warning system (GPWS); and configuration warnings.

As a result of erroneous radio altimeter data provided to these systems in the event of 5G C-Band interference, takeoff and landing performance can be adversely impacted. This may have multiple effects, including:

- Autothrottle may remain in speed (SPD) mode and may increase thrust to maintain speed during flare instead of reducing the thrust to IDLE at 27 feet radio altitude (RA) or may reduce thrust to IDLE prematurely.

- Thrust reversers may not deploy during rejected takeoff or landing roll.

- Engines may be at higher idle during rejected takeoff or remain at approach idle after touchdown.

- Automatic speedbrake may not deploy after touchdown during the landing roll.

- SPEEDBRAKE EXTENDED light may not be available or may illuminate erroneously during the landing roll.

- SPEEDBRAKE time critical visual and aural warnings may not be available during the landing roll.

- Spoilers may be limited to their maximum in-flight position during manual deployment after rejected takeoff or touchdown during the landing roll.

- Landing Attitude Modifier may be erroneous.

- Other simultaneous flight deck effects associated with the 5G C-Band interference could increase pilot workload.

As a result of these effects, lack of thrust reverser and speedbrake deployment, limited spoiler extension, and increased idle thrust may occur; and brakes may be the only means to slow the airplane. Therefore, the presence of 5G C-Band interference can result in degraded deceleration performance, subsequently resulting in longer than normal landing or rejected takeoff distances, which could lead to a runway excursion. This is an unsafe condition.

The severity of the hazard created by a lack of thrust reverser and speedbrake deployment, limited spoiler extension, and by increased idle thrust, increases when the runway is contaminated with frozen or liquid precipitation. The FAA categorizes runway surface conditions with codes from 6 through 0, with 6 being a dry runway and therefore

no detrimental effect on braking, and a code of 0 denoting surface conditions, such as wet ice, in which braking may not be effective.

This AD mandates procedures for operators to account for this longer than normal landing or rejected takeoff distances, for all runway conditions, in the presence of 5G C-Band interference as identified by NOTAM. It prohibits operators from dispatching or releasing airplanes to or from affected airports when certain braking and anti-skid functions on the airplane are inoperable. It also prohibits operators from dispatch or release to, or takeoff or landing on, runways with condition codes 1 and 0.

The FAA is issuing this AD to address the unsafe condition on these products.

FAA's Determination

The FAA is issuing this AD because the agency has determined the unsafe condition described previously is likely to exist or develop in other products of the same type design.

AD Requirements

This AD requires revising the limitations and operating procedures sections of the existing AFM to incorporate limitations prohibiting the use of certain MEL items, and to incorporate operating procedures for calculating takeoff and landing distances, when in the presence of 5G C-Band interference as identified by NOTAMs.

Compliance with AFM Revisions

Section 91.9 prohibits any person from operating a civil aircraft without complying with the operating limitations specified in the AFM. FAA regulations also require operators to furnish pilots with any changes to the AFM (14 CFR 121.137) and pilots in command to be familiar with the AFM (14 CFR 91.505).

Interim Action

The FAA considers this AD to be an interim action. If final action is later identified, the FAA might consider further rulemaking.

Justification for Immediate Adoption and Determination of the Effective Date

Section 553(b)(3)(B) of the Administrative Procedure Act (APA) (5 U.S.C. 551 *et seq.*) authorizes agencies to dispense with notice and comment procedures for rules when the agency, for “good cause,” finds that those procedures are “impracticable, unnecessary, or contrary to the public interest.” Under this section, an agency, upon finding good cause, may issue a final rule without providing notice and seeking comment prior to issuance. Further, section 553(d) of the APA authorizes agencies to make rules effective in less than thirty days, upon a finding of good cause.

An unsafe condition exists that requires the immediate adoption of this AD without providing an opportunity for public comments prior to adoption. The FAA has found that the risk to the flying public justifies forgoing notice and comment prior to adoption of this rule because during takeoffs and landings, as a result of 5G C-Band interference, certain airplane systems may not properly function, resulting in longer than normal landing or rejected takeoff distances due to the effect on thrust reverser deployment, spoilers, speedbrake deployment, and increased idle thrust, regardless of the approach type or weather. This could result in a runway excursion. The urgency is based on C-Band wireless broadband deployment, which was expected to occur in phases with operations beginning on January 19, 2022. Accordingly, notice and opportunity for prior public comment are impracticable and contrary to the public interest pursuant to 5 U.S.C. 553(b)(3)(B).

In addition, the FAA finds that good cause exists pursuant to 5 U.S.C. 553(d) for making this amendment effective in less than 30 days, for the same reasons the FAA found good cause to forgo notice and comment.

Comments Invited

The FAA invites you to send any written data, views, or arguments about this final rule. Send your comments to an address listed under ADDRESSES. Include Docket

No. FAA-2022-0017 and Project Identifier AD-2022-00058-T at the beginning of your comments. The most helpful comments reference a specific portion of the final rule, explain the reason for any recommended change, and include supporting data. The FAA will consider all comments received by the closing date and may amend this final rule because of those comments.

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all comments received, without change, to <https://www.regulations.gov>, including any personal information you provide. The agency will also post a report summarizing each substantive verbal contact received about this final rule.

Confidential Business Information

CBI is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this AD contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this AD, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as “PROPIN.” The FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this AD. Submissions containing CBI should be sent to Dean Thompson, Senior Aerospace Engineer, Systems and Equipment Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3165; email: dean.r.thompson@faa.gov. Any commentary that the FAA receives that is not specifically designated as CBI will be placed in the public docket for this rulemaking.

Regulatory Flexibility Act

The requirements of the Regulatory Flexibility Act (RFA) do not apply when an agency finds good cause pursuant to 5 U.S.C. 553 to adopt a rule without prior notice and comment. Because the FAA has determined that it has good cause to adopt this rule without notice and comment, RFA analysis is not required.

Costs of Compliance

The FAA estimates that this AD affects 177 airplanes of U.S. registry. The FAA estimates the following costs to comply with this AD:

Estimated costs

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
AFM revision	1 work-hour X \$85 per hour = \$85	\$0	\$85	\$15,045

Authority for this Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs describes in more detail the scope of the Agency's authority.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

Regulatory Findings

This AD will not have federalism implications under Executive Order 13132. This AD will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify that this AD:

- (1) Is not a “significant regulatory action” under Executive Order 12866, and
- (2) Will not affect intrastate aviation in Alaska.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

The Amendment

Accordingly, under the authority delegated to me by the Administrator, the FAA amends 14 CFR part 39 as follows:

PART 39 - AIRWORTHINESS DIRECTIVES

- 1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

- 2. The FAA amends § 39.13 by adding the following new airworthiness directive:

2022-03-20 The Boeing Company: Amendment 39-21937 ; Docket No. FAA-2022-0017; Project Identifier AD-2022-00058-T.

(a) Effective Date

This airworthiness directive (AD) is effective [INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) Affected ADs

None.

(c) Applicability

This AD applies to The Boeing Company Model 737-8, 737-9, and 737-8200 airplanes, certificated in any category.

(d) Subject

Air Transport Association (ATA) of America Code 34, Navigation.

(e) Unsafe Condition

This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band), and a determination that, during takeoffs and landings, as a result of this interference, certain airplane systems may not properly function, resulting in longer than normal landing or rejected takeoff distances due to the effect on thrust reverser deployment, spoilers, speedbrake deployment, and increased idle thrust, regardless of the approach type or weather. The FAA is issuing this AD to address degraded deceleration performance, which could lead to a runway excursion.

(f) Compliance

Comply with this AD within the compliance times specified, unless already done.

(g) Definitions

Runway condition codes are defined in figure 1 to paragraph (g) of this AD.

Figure 1 to paragraph (g) – *Runway Condition Codes*

Runway Condition Code	Runway Condition Description	Reported Braking Action
6	Dry	Dry
5	Wet (smooth, grooved, or porous friction course (PFC)) or frost 3 mm (0.12 inches) or less of: water, slush, dry snow, or wet snow	Good
4	Compacted snow at or below -15°C (5°F) outside air temperature (OAT)	Good to medium
3	Wet (slippery), dry snow, or wet snow (any depth) over compacted snow	Medium

Runway Condition Code	Runway Condition Description	Reported Braking Action
	Greater than 3 mm (0.12 inches) of: dry snow or wet snow Compacted snow at OAT warmer than -15°C (5°F)	
2	Greater than 3 mm (0.12 inches) of: water or slush	Medium to poor
1	Ice	Poor
0	Wet ice, water on top of compacted snow, dry snow, or wet snow over ice	Nil

(h) Airplane Flight Manual (AFM) Revision

(1) Within 2 days after the effective date of this AD: Revise the Limitations

Section of the existing AFM to include the information specified in figure 2 to paragraph (h)(1) of this AD. This may be done by inserting a copy of figure 2 to paragraph (h)(1) of this AD into the existing AFM.

Figure 2 to paragraph (h)(1) – *AFM Limitations Revision*

(Required by AD 2022-03-20)

Radio Altimeter 5G C-Band Interference, Takeoff and Landing Performance

The following limitations are required for dispatch or release to airports, and takeoff or landing on runways, in U.S. airspace in the presence of 5G C-Band wireless broadband interference as identified by NOTAM (NOTAMs will be issued to state the specific airports or approaches where the radio altimeter is unreliable due to the presence of 5G C-Band wireless broadband interference).

Minimum Equipment List (MEL)

Dispatch or release with any of the following MEL items is prohibited:

- 32-42-01 – Antiskid Systems
- 32-42-02 – Alternate Antiskid Valves
- 32-42-03 – Automatic Brake System
- 32-44-01 – Parking Brake Valve

Landing Operations on Runways with Condition Code 1 or 0

Dispatch or release to, or takeoff or landing on, runways with a runway condition code of 1 or 0 is prohibited.

Takeoff and Landing Performance

Operators must use the 5G C-Band Interference Takeoff Performance and Landing Distance Calculations procedure contained in the Operating Procedures Section of this AFM.

(2) Within 2 days after the effective date of this AD: Revise the Operating Procedures Section of the existing AFM to include the information specified in figure 3 to paragraph (h)(2) of this AD. This may be done by inserting a copy of figure 3 to paragraph (h)(2) of this AD into the existing AFM.

Figure 3 to paragraph (h)(2) – AFM Operating Procedures Revision

(Required by AD 2022-03-20)

5G C-Band Interference Takeoff Performance and Landing Distance Calculations

Dispatch Guidance – Takeoff Performance

Stopping distance during a rejected takeoff (RTO) can be significantly increased due to the following potential effects on airplane systems:

- Limited spoiler extension
- Higher engine idle
- Thrust reversers may not deploy

For the increased stopping distance during an RTO, refer to the Departure Airport, Takeoff Performance section below.

Dispatch Guidance – Destination or Alternate Airport – Landing Performance

Calculate the required landing distance (select Method A or Method B).

Method A: Use of normal landing performance increased by a predetermined percentage

Use Prior to Descent, Required Landing Distance section below.

Method B: Use of the Non-Normal Configuration Landing Distance table for SPOILERS

Use the SPOILERS Non-Normal Configuration Landing Distance table in the Performance chapter of the AFM, or the applicable table below, for flaps 30 or flaps 40.

- Use the distance for MAX MANUAL braking configurations with the appropriate runway condition at estimated time of arrival.
- Apply all of the appropriate distance adjustments to include the reverse thrust adjustment for no reverse (NO REV).

For runway condition codes 6 and 5, obtain the required landing distance by using the higher of:

- The resulting unfactored distance increased by 15%, or
- The normal dispatch calculations.

For runway condition codes 4 and 3, increase the resulting unfactored distance by 15% to obtain the required landing distance.

For runway condition code 2, increase the resulting unfactored distance by 30% to obtain the required landing distance.

End of Method B

Departure Airport, Takeoff Performance

Select Method 1 or 2 to adjust the accelerate stop distance available (ASDA).

Note: Both methods provide an acceptable margin of safety.

Method 1: Adjust the ASDA by a predetermined value.

Adjust the ASDA by using the following adjustment:

Runway Condition Code	Runway Condition Description	Subtract from ASDA
6	Dry	950 feet
5	Wet skid resistant*	2,600 feet
5, 4, or 3	Wet/dry snow/wet snow/compact snow/slippery	3,700 feet
2	Slush or standing water	4,900 feet

*Provided approval to use wet skid resistant data has been received from the appropriate regulatory authority in accordance with the AFM.

Use the adjusted ASDA and complete the takeoff performance calculations using actual departure runway conditions and actual departure environmental conditions. Do not take credit for use of reverse thrust when calculating takeoff performance.

End of Method 1**Method 2: Adjust the ASDA by a predetermined factor.**

Multiply the ASDA by the following factor:

Runway Condition Code	Runway Condition Description	ASDA Factor
6	Dry	0.86
5	Wet skid resistant*	0.76
5, 4, or 3	Wet/dry snow/wet snow/compact snow/slippery	0.71
2	Slush or standing water	0.65

*Provided approval to use wet skid resistant data has been received from the appropriate regulatory authority in accordance with the AFM.

Use the adjusted ASDA and complete the takeoff performance calculations using actual departure runway conditions and actual departure environmental conditions. Do not take credit for use of reverse thrust when calculating takeoff performance.

End of Method 2**Prior to takeoff:**

Verify normal radio altimeter indications.

Climb out:

- TO/GA mode may not be available
- Monitor pitch mode engagement

- Monitor roll mode engagement
- Autopilot may not engage

Prior to Descent, Required Landing Distance

Do a time of arrival (en route) landing distance assessment using Method A or B. Use the SPOILERS Non-Normal Configuration Landing Distance table in the Performance chapter of the AFM, or the applicable table below, for flaps 30 or flaps 40.

Method A: Use of normal landing performance and increase by a predetermined percentage.

Use the Normal Configuration Landing Distance table for flaps 30 or flaps 40.

Note: The distances and adjustments shown in the Normal Configuration Landing Distance tables are factored and have been increased 15%.

Select the appropriate runway condition.

Select the distance for the MAX MANUAL braking configuration.

Apply all of the appropriate distance adjustments.

Note: Do not apply adjustments for reverse thrust.

To obtain the required landing distance, increase the resulting factored distance by the percentage below in Table 1 based on the runway condition code or runway braking action.

Table 1

Runway Condition Code	Reported Braking Action	Percentage
6	Dry	23%
5	Good	63%
4	Good to medium	56%
3	Medium	65%
2	Medium to poor	113%

Determine autobrake settings using the Determine Autobrake Settings section below.

End of Method A

Method B: Use of the Non-Normal Configuration Landing Distance table for SPOILERS

Use the SPOILERS Non-Normal Configuration Landing Distance table in the Performance chapter of the AFM, or the applicable table below, for flaps 30 or flaps 40.

Select the appropriate runway condition.

Select the distance for MAX MANUAL braking configuration.

Apply all of the appropriate distance adjustments including the reverse thrust adjustment for no reverse (NO REV).

For runway condition codes 6 to 3, increase the resulting unfactored distance by 15% to obtain the required landing distance.

For runway condition code 2, increase the resulting unfactored distance by 30% to obtain the required landing distance.

Determine autobrake settings using the Determine Autobrake Settings section below.

SPOILERS Non-Normal Configuration Landing Distance Tables

737-8 and 737-8200 One Position Tailskid, FLAPS 30, VREF30

Landing Distances and Adjustments (Feet)									
Runway Condition Code	Reference Distance	Weight Adjustment	Altitude Adjustment*	Wind Adjustment per 10 Knots	Slope Adjustment per 1%	Temperature Adjustment per 10°C	Approach Speed Adjustment	Reverse Thrust Adjustment	
	150,000 LB Landing Weight	Per 10,000 LB Above / Below 150,000 LB	Per 1,000 ft STD / HIGH	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	4870	250 / -270	130 / 170	-210 / 680	80 / -70	130 / -130	310	180	280
5	6300	420 / -410	230 / 320	-330 / 1160	200 / -170	210 / -210	420	610	1300
4	6890	430 / -430	240 / 330	-350 / 1210	260 / -210	210 / -210	420	740	1620
3	7330	450 / -450	250 / 340	-360 / 1270	310 / -250	220 / -220	420	910	2090
2	8290	610 / -570	330 / 460	-470 / 1660	440 / -340	280 / -280	450	1530	4410

737-8 and 737-8200 Two Position Tailskid, FLAPS 30, VREF30

Landing Distances and Adjustments (Feet)									
Runway Condition Code	Reference Distance	Weight Adjustment	Altitude Adjustment*	Wind Adjustment per 10 Knots	Slope Adjustment per 1%	Temperature Adjustment per 10°C	Approach Speed Adjustment	Reverse Thrust Adjustment	
	150,000 LB Landing Weight	Per 10,000 LB Above / Below 150,000 LB	Per 1,000 ft STD / HIGH	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	4670	250 / -250	130 / 170	-210 / 670	80 / -70	120 / -120	300	160	250
5	6030	410 / -380	220 / 320	-320 / 1130	190 / -160	200 / -200	410	550	1170
4	6610	420 / -400	230 / 330	-340 / 1180	240 / -200	200 / -200	410	680	1480
3	7050	430 / -420	240 / 340	-360 / 1240	300 / -240	210 / -200	410	850	1960
2	7980	590 / -540	330 / 460	-460 / 1640	420 / -330	270 / -270	450	1430	4110

737-9 FLAPS 30, VREF30

Landing Distances and Adjustments (Feet)									
Runway Condition Code	Reference Distance	Weight Adjustment	Altitude Adjustment*	Wind Adjustment per 10 Knots	Slope Adjustment per 1%	Temperature Adjustment per 10°C	Approach Speed Adjustment	Reverse Thrust Adjustment	
	160,000 LB Landing Weight	Per 10,000 LB Above / Below 160,000 LB	Per 1,000 ft STD / HIGH	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	5030	250 / -250	140 / 170	-210 / 690	90 / -80	130 / -130	310	170	270
5	6530	410 / -380	250 / 330	-340 / 1180	220 / -180	210 / -210	420	610	1290
4	7090	420 / -400	260 / 340	-350 / 1230	270 / -220	220 / -220	420	720	1560
3	7550	430 / -420	270 / 350	-370 / 1290	330 / -260	220 / -220	420	880	1990
2	8530	590 / -530	360 / 480	-480 / 1690	460 / -360	290 / -290	460	1480	4070

737-8 and 737-8200 One Position Tailskid, FLAPS 40, VREF40

Landing Distances and Adjustments (Feet)									
Runway Condition Code	Reference Distance	Weight Adjustment	Altitude Adjustment*	Wind Adjustment per 10 Knots	Slope Adjustment per 1%	Temperature Adjustment per 10°C	Approach Speed Adjustment	Reverse Thrust Adjustment	
	150,000 LB Landing Weight	Per 10,000 LB Above / Below 150,000 LB	Per 1,000 ft STD / HIGH	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	4630	300 / -250	140 / 170	-210 / 670	90 / -80	120 / -120	330	160	250
5	5860	490 / -380	230 / 310	-320 / 1110	190 / -160	190 / -190	420	510	1070
4	6450	500 / -390	230 / 320	-340 / 1170	250 / -200	190 / -190	420	640	1380
3	6900	510 / -420	240 / 330	-350 / 1230	310 / -240	200 / -200	410	800	1630
2	7670	670 / -520	320 / 450	-450 / 1610	410 / -320	260 / -260	450	1260	3430

737-8 and 737-8200 Two Position Tailskid, FLAPS 40, VREF40

Landing Distances and Adjustments (Feet)									
Runway Condition Code	Reference Distance	Weight Adjustment	Altitude Adjustment*	Wind Adjustment per 10 Knots	Slope Adjustment per 1%	Temperature Adjustment per 10°C	Approach Speed Adjustment	Reverse Thrust Adjustment	
	150,000 LB Landing Weight	Per 10,000 LB Above / Below 150,000 LB	Per 1,000 ft STD / HIGH	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	4600	310 / -250	140 / 170	-210 / 670	90 / -70	120 / -120	330	160	250
5	5830	500 / -370	230 / 310	-320 / 1110	190 / -160	190 / -190	420	510	1060
4	6420	510 / -390	240 / 320	-330 / 1160	250 / -200	190 / -190	420	630	1370
3	6870	520 / -410	250 / 330	-350 / 1220	310 / -240	200 / -200	410	800	1620
2	7630	680 / -520	330 / 450	-450 / 1610	410 / -320	260 / -260	450	1250	3400

Landing Distances and Adjustments (Feet)									
Runway Condition Code	Reference Distance	Weight Adjustment	Altitude Adjustment*	Wind Adjustment per 10 Knots	Slope Adjustment per 1%	Temperature Adjustment per 10°C	Approach Speed Adjustment	Reverse Thrust Adjustment	
	180,000 LB Landing Weight	Per 10,000 LB Above / Below 180,000 LB	Per 1,000 ft STD / HIGH	Head / Tail Wind	Down / Up Hill	Above / Below ISA	per 5 KTS above VREF	One Reverser	No Reverser
6	4920	330 / -250	150 / 180	-210 / 690	90 / -80	130 / -130	330	170	260
5	6280	520 / -370	250 / 340	-330 / 1160	210 / -180	200 / -200	430	550	1150
4	6850	520 / -390	250 / 340	-350 / 1200	270 / -220	210 / -210	430	660	1410
3	7300	540 / -410	260 / 350	-360 / 1260	330 / -260	210 / -210	430	820	1830
2	8140	690 / -510	340 / 470	-480 / 1650	450 / -340	270 / -270	460	1290	3420

*For landing distance at or below 8,000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8,000 ft, first apply the STD adjustment to derive a new reference landing distance for 8,000 ft then apply the HIGH adjustment to this new reference distance.

Reference distance is based on MAX MANUAL braking, sea level, standard day, no wind or slope and maximum reverse thrust.

Reference distance includes a distance from threshold to touchdown associated with a flare time of 7 seconds.

Distances are based on SPOILERS failure distances which conservatively approximates the effects of 5G interference after the Reverse Thrust Adjustment for no Reversers is applied.

Actual (unfactored) distances are shown.

Note: per procedure, MAX MANUAL braking is not required for normal operations.

End of Method B

Determine Autobrake Settings

- Determine desired AUTOBRAKE setting by using the normal configuration landing distance.

Note: Normal manual or normal autobrakes can be used. The use of maximum brakes is not needed except as stated in the During Landing section below.

During Approach

- Monitor radio altimeters for anomalies.
- Monitor performance of autopilot and autothrottle. If the autopilot or autothrottle is not performing as expected, disconnect both the autopilot and autothrottle and apply manual inputs to ensure proper control of flight path.

At DA(H), MDA(H), or the Missed Approach Point

- If suitable visual reference is established, disengage the autopilot and autothrottle and continue for a normal manual landing.
- If a go-around is needed, do the go-around and the missed approach procedure either in manual or automatic flight.

During Landing

- Radio altitude-based altitude aural callouts during approach may not be available or may be erroneous.
- Manual deployment of the speedbrakes may be needed.
- If the thrust reversers do not deploy, immediately ensure the speedbrakes are extended, apply manual braking, and modulate as needed for the existing runway conditions.

Note: In some conditions, maximum manual braking may be needed throughout the entire landing roll.

During Go-around and Missed Approach

- TO/GA mode may not be available.
- Monitor thrust and verify that thrust increases.
- Monitor pitch mode engagement.
- Monitor roll mode engagement.
- Autopilot may not engage.

Note 1 to paragraph (h): Guidance for accomplishing the actions required by this AD can be found in Boeing Multi Operator Message MOM-MOM-22-0016-01B(R1), dated January 16, 2022, and Boeing Flight Crew Operations Manual Bulletin TBC-26, “Radio Altimeter Anomalies due to 5G C-Band Wireless Broadband Interference in the United States,” dated January 17, 2022.

(i) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Seattle ACO Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or responsible Flight Standards Office, as appropriate. If sending information directly to the manager of the certification office, send it to the attention of the person identified in paragraph (j)(1) of this AD. Information may be emailed to: 9-ANM-Seattle-ACO-AMOC-Requests@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the responsible Flight Standards Office.

(3) AMOCs approved for AD 2021-23-12, Amendment 39-21810 (86 FR 69984, December 9, 2021) providing relief for specific radio altimeter installations are approved as AMOCs for the provisions of this AD.

(j) Related Information

(1) For more information about this AD, contact Dean Thompson, Senior Aerospace Engineer, Systems and Equipment Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3165; email: dean.r.thompson@faa.gov.

(2) For service information identified in this AD that is not incorporated by reference, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; Internet <https://www.myboeingfleet.com>.

(k) Material Incorporated by Reference

None.

Issued on January 26, 2022.

Lance T. Gant, Director,
Compliance & Airworthiness Division,
Aircraft Certification Service.

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